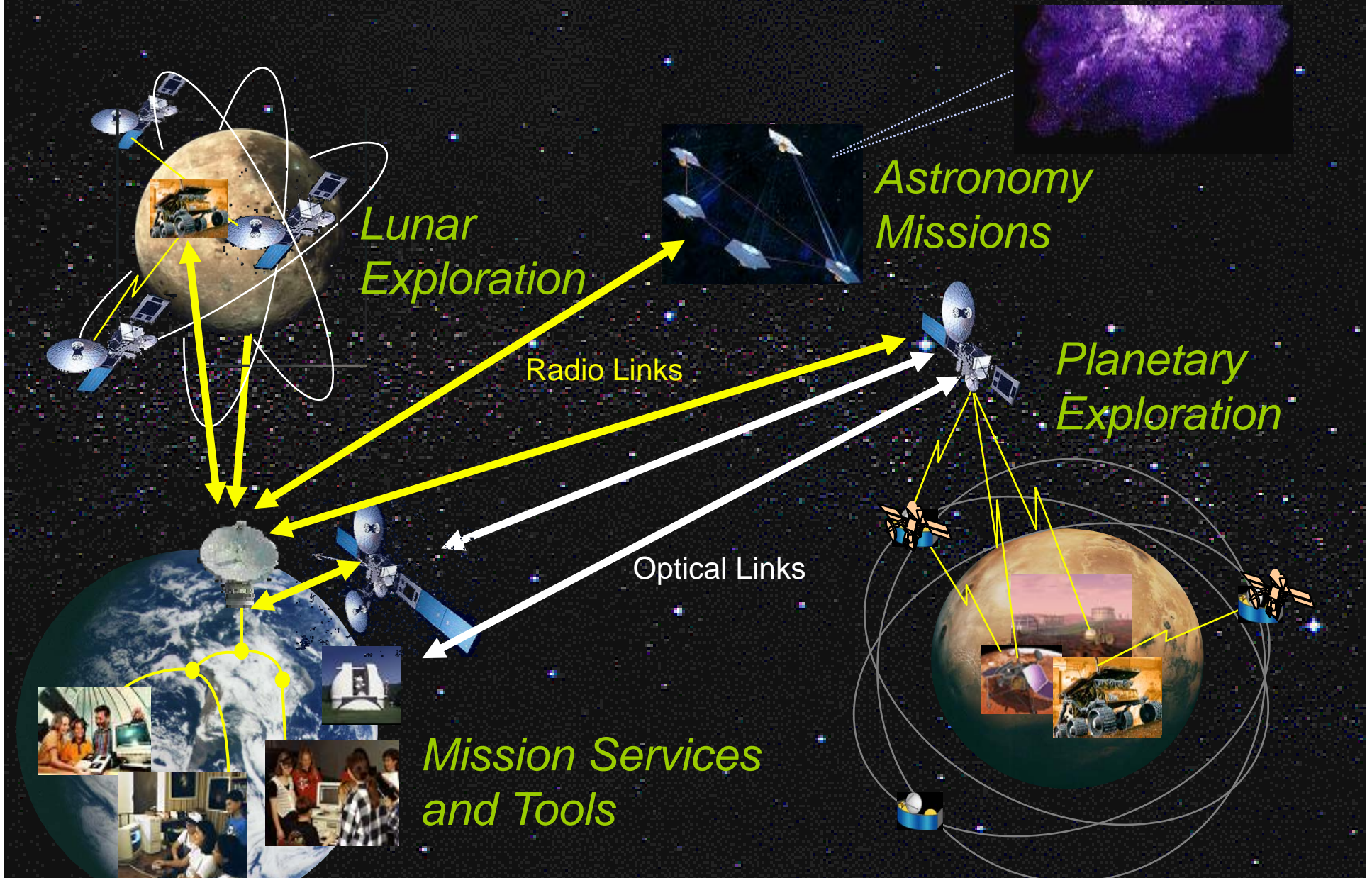


Partnering Opportunities in 9x



William Weber
Director For Interplanetary Network Directorate

The Interplanetary Network



Major Elements of IND

- Deep Space Network (DSN)
- Next Generation DSN
 - Array-based
 - Optical
- Multi-mission tools and services
- Mission IT and networking
- Needed technologies

The Deep Space Network

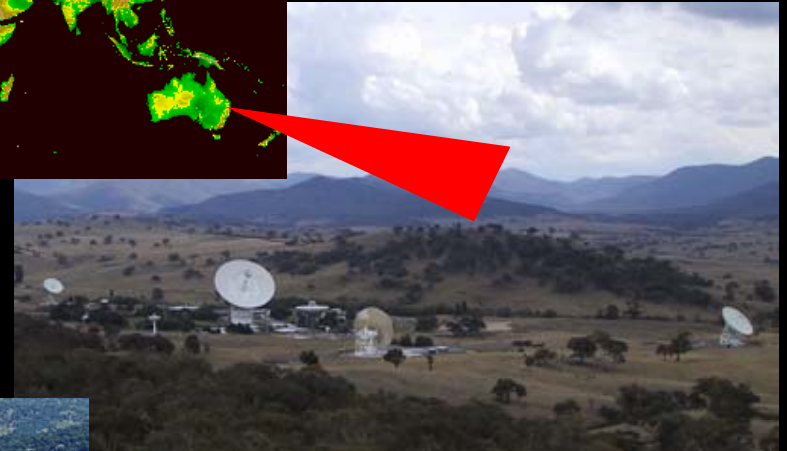
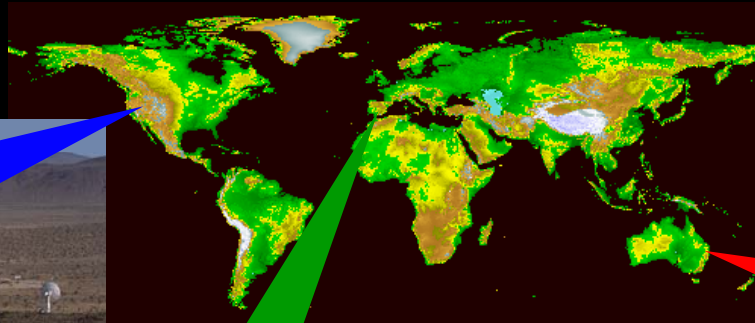
Comprises three major tracking sites around the globe to provide continuous communication and navigation support for the world's deep space missions.



Goldstone
*Operated by
ITT for
NASA/JPL*



Madrid
*Operated by
INSA for INTA*

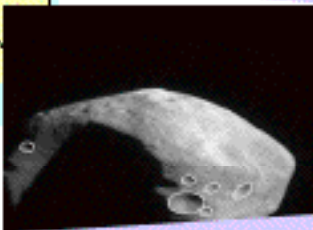
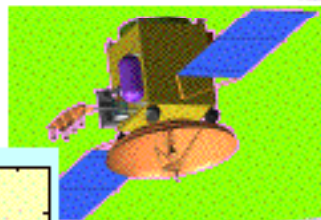
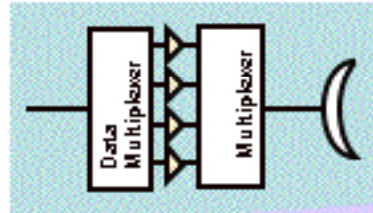
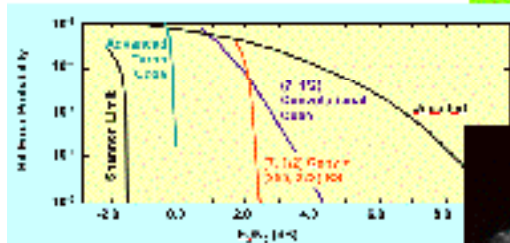
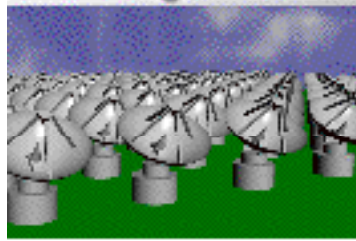


Canberra
*Operated by
Raytheon for
CSIRO*

Current DSN Areas of Emphasis

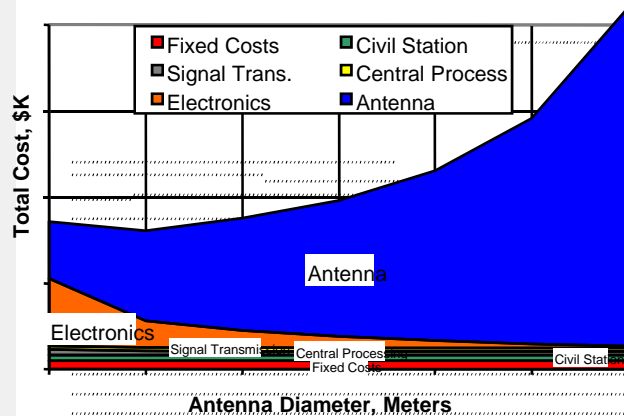
- **Near-Term**
 - Refurbish and modernize the existing assets and infrastructure
 - Electronics, software, antenna mechanical, facilities, power
 - Reduce operations and maintenance costs
 - Scheduling of the assets and services
 - Monitor and control
 - Higher degree of automation
- **Long-Term**
 - Augment existing antenna assets with more 34m antennas or their equivalent in arrays of smaller antennas
- **Longer-Term**
 - Optical communications

Key DSN Technology Areas



- **Ka-band communications**
 - 4x performance gain and increased bandwidth
- **High power spacecraft comm**
 - Take advantage of Project Prometheus
- **Large arrays of small antennas**
 - Earth infrastructure of the future
- **Optical communications**
 - New infrastructure for high bandwidth
- **Error-correcting codes**
 - Protect data sent through deep space
- **Data compression**
 - Use links efficiently
- **Ultra-stable clocks (including spaceborne)**
 - Perform precision navigation
- **Communications standards**
 - Guarantee quality and interagency cross-support

Synthesizing Large Antenna Apertures



- A new paradigm for microwave, large-aperture synthesis
- Requirements:
 - Low cost, high performance antennas
 - Low cost, low noise amplifiers
 - Low cost, reliable, cryogenics
 - Mass production efficiencies
- Potential for significantly lower cost than large antennas

Optical Communications

- Optical comm is a key element of the DSN vision
 - High bandwidth for trunk lines from exploration targets
 - High performance for extreme outer planet missions
- Technology is ready for deep space demo
- Missions of opportunity need to be identified



**DSMS Program's Optical
Comm Telescope Laboratory**



**Prototype optical
comm payload**

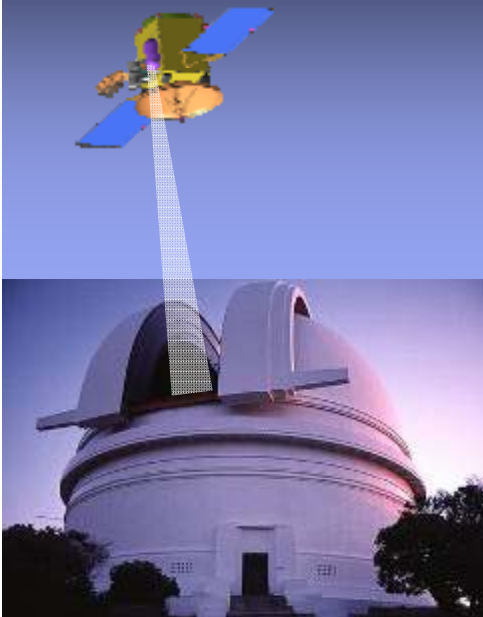
Today's DSN



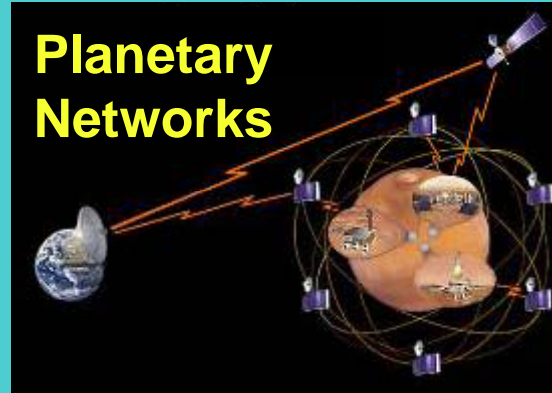
DSN Array



Optical Communications



Planetary Networks



NASA Space Networking



Multimission Ground System and Services Advanced Multimission Operations System

- AMMOS is a product line developed and provided by the MGSS Program Office
 - Multi-mission software tools for mission operations
 - Applied to a wide variety of planning-intensive missions, such as deep space and astrophysics missions
 - Sources include COTS, JPL, and other NASA centers
- Functional areas include:
 - Mission Design
 - Navigation
 - Science Instrument operations
 - Mission Planning & Spacecraft Sequencing
 - Operations Configuration Management
 - Mission Assurance
 - Spacecraft command, control and monitoring
 - Command and telemetry processing
 - Flight system performance analysis
 - Fault detection and alarm
 - Data Management and Accountability
 - DSN Scheduling
 - Mars Relay Operations planning and scheduling

Multimission Ground System and Services Advanced Multimission Operations System

Possible additional Industry provided solutions for AMMOS:

- ✓ Data Management File system management
- ✓ Data backup systems
- ✓ Configuration management
- ✓ Data and schema registry
- ✓ Product tracking and accountability
- ✓ Workflow management
- ✓ Common Visualization software
- ✓ Image format conversion
- ✓ Very large image display, pan and zoom
- ✓ Resource management and scheduling
- ✓ Test automation tools
- ✓ Service Oriented Architecture (SOA) solutions such as:
 - Platform (application servers)
 - Consulting services
 - Information modeling
 - Messaging Systems



Mission Software, Computing and Networking Office (980)

- Objectives:
 - Increase the reliability of JPL mission software
 - Develop computer science based functions and products
 - Cross-cutting, serving a broad spectrum of JPL missions
- Industry Opportunities
 - Low-TRL technology developments
 - Partnering as co-investigators on competed research proposals
 - Infusion of technology into missions through mid-TRL maturation
 - Example technology areas:
 - Software engineering tools, spacecraft autonomy, event detection and response, flight computing architectures, operations automation, robotics autonomy, smart instruments, supercomputer-based modeling, space network protocols and management, knowledge management, ISHM, ...